

REMARKS

The Office Action dated November 23, 2005, has been received and reviewed.

Claims 1, 3, 5-25, 28-35, 53 and 54 are currently pending and under consideration in the above-referenced application. Each of claims 1, 3-23, 25, 28, 30-35, 53 and 54 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections under 35 U.S.C. § 102

Claims 18-21, 30, 31, 33-35 and 54 stand rejected under 35 U.S.C. § 102(e) for reciting subject matter which is purportedly anticipated by that described in U.S. Patent 6,437,449 to Foster (hereinafter "Foster").

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single reference which qualifies as prior art under 35 U.S.C. § 102. *Verdegaal Brothers v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The identical invention must be shown in as complete detail as is contained in the claim. *Richardson v. Suzuki Motor Co.*, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Foster discloses a packaged multi-chip module assembly. A semiconductor die 108 is mounted to and is communication with a die-mounting pad 104 that is part of substrate 102. Col. 2, lines 63-64; Col. 3, lines 7-12; FIG. 2. A spacer 116 is mounted on the front surface 110 of the first semiconductor die 108 so as to electrically isolate the spacer from the die. Col. 3, lines 20-21, 45-46; FIG. 2. A bond is formed between the end 130 of the wire 124 and the spacer 116, although the purpose is "not to make an electrical connection with the spacer." Col. 4, lines 9-15; FIG. 2. Embedding the end 130 of the wire 124 in a layer of conductive material 146 that is the *same thickness as the bond* and lies upon the surface of the spacer 116 "eliminates the need for an electrically conductive spacer 116 and a wire-bonding 'step' thereon." Col. 4, lines 49-54; FIG. 2. The conductive layer 146, connected to the wire 124 and the second semiconductor die 140, permits the second die 140 to be biased to the same or different electrical potential as the first die 108. Col. 4, lines 63-68.

Foster, however, does not expressly or inherently disclose each and every element of independent claim 18. Among others, Foster does not expressly or inherently disclose a

semiconductor device assembly that includes mutually laterally spaced discrete spacers in communication with a ground or reference voltage plane with at least one of the spacers being compressible. Foster discloses a single spacer 116 disposed between the semiconductor dice 140 and 108. FIG. 2. Additionally, Foster does not expressly or inherently disclose that the *adhesive* layers 121/221 are spacers, as the Examiner asserts. Even assuming, *arguendo*, that one skilled in the art would consider the adhesive layer a spacer, which Applicant does not concede, Foster does not expressly or inherently disclose that the adhesive layers 121/221 are *laterally* spaced from the spacer 116. Therefore, Foster does not anticipate each and every limitation of independent claim 18. Accordingly, withdrawal of the 35 U.S.C. §102(e) rejection of claim 18 is respectfully requested.

The withdrawal of the 35 U.S.C. § 102(e) rejection of claims 19-21, 30, 31, 33-35, and 54 is respectfully requested as each of these claims depends either directly or indirectly from allowable independent claim 18, among other reasons.

Rejections under 35 U.S.C. § 103(a)

The standard for establishing and maintaining a rejection under 35 U.S.C. § 103(a) is set forth in M.P.E.P. § 706.02(j), which provides:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Pu in View of LoBianco

Claims 1, 3, 5-8, 10, 12-17 and 53 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in U.S. Patent 6,593,662 to

Pu *et al.*, (hereinafter “Pu”) and U.S. Patent 6,340,846 to LoBianco, *et al.* (hereinafter “LoBianco”).

Pu teaches a stacked multi-chip structure. An adhesive layer 204a adheres a first die 206 to a substrate 202. Col. 4, lines 13-15; FIGs. 4A, 4B. Adhesive layer 204b adheres spacers 220 to the first die 206, and a second adhesive layer 204c adheres a second die 208 on top of the spacers 220. Col. 4, lines 17-20; FIGs. 4A, 4B. The spacers, made of silicon or metal, provide sufficient rigidity to avoid compression, which is referred to in Pu as “the cushion effect,” during the wire bonding process. Pu asserts that the cushion effect is a problem associated with other stacking methods that used compressible materials, such as polyimide tape. Col. 2, lines 12-15; Col. 4, lines 36-39, 47-53; FIGs. 4A, 4B. The cushion effect occurs during wirebonding when a material compresses under the force applied to the material during the wirebonding process. As the material compresses, the wire that is to be bonded to the material no longer is in optimal contact with the material’s surface, resulting in a bond of substandard quality. Thus, Pu teaches away from the use of compressible spacers.

LoBianco teaches a multi-chip package in which two dice are adhered together with an adhesive layer. A substrate 12 has a first die 14 adhered to the top surface of the substrate 12 with an adhesive layer 13. Col. 3, lines 50-55; FIG. 3. Bond wires connect the die 14 to the substrate 12. A spacer 50 might be placed atop the first die 14 with a layer of adhesive 54. Col. 6, lines 60-68; FIG. 8. An adhesive layer 40 is then dispensed onto the top of the first die 14 and around the spacer 50 and a second die 16 is pressed down onto the adhesive 40 until it contacts a layer of adhesive 52 on the top of the spacer 50. Col. 7, lines 1-4; FIG. 8. The spacer 50 might be made from a fiberglass matrix impregnated epoxy resin, ceramic, or plastic polymer. Col. 7, lines 20-24. The adhesive layers 40, 52, and 54 are cured and bonding pads on the second die 16 may be wire bonded to the substrate 12. Col. 5, lines 15-18; Col. 7, lines 34-36; FIGs. 3, 8. The spacer 50 and cured adhesive layers 40, 52, 54 provide support to the second die from the bending and shear forces imposed during the wire bonding process, forces that might otherwise fracture the die. Col. 5, lines 18-24; FIG. 2.

Neither Pu nor LoBianco, however, teaches or suggests all of the claim limitations present in independent claim 1. Among other things, neither Pu nor LoBianco teaches or

suggests a semiconductor device assembly that includes at least one resiliently compressible spacer. As discussed above, the spacer of Pu may be either silicon or metal. The spacers of LoBianco may be ceramic, epoxy, or a polymer. Neither of these references teaches or suggests a resiliently compressible spacer.

Moreover, as neither Pu nor LoBianco teaches or suggests a resiliently compressible spacer, neither provides a suggestion or motivation to combine the references, nor would one skilled in the art be motivated to make the proposed modification. Instead, it appears that the only motivation to combine the teachings of Pu with those of LoBianco apparently derives from impermissible hindsight.

Additionally, Pu teaches away from the subject matter of independent claim 1. Pu teaches that compressible materials, such as polyimide tapes, are insufficiently rigid, resulting in a cushion effect on the second die, which negatively affects the quality and the reliability of the wire bonding. Pu, Col. 2, lines 12-14. Thus, Pu teaches away from a resiliently compressible spacer, which further indicates the non-obviousness of independent claim 1. *In re Hedges*, 783 F.2d 1038, 228 USPQ 685 (Fed. Cir. 1986); M.P.E.P. § 2146(X)(D)(3)(“proceeding contrary to accepted wisdom in the art is evidence of nonobviousness”); *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997); M.P.E.P. § 2144.05(III)(“A *prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention.”).

Moreover, assuming, *arguendo*, that LoBianco, as the Office asserts but Applicant does not concede, actually teaches a resilient spacer, Pu teaches away from the asserted combination of teachings from these references. More specifically, Pu teaches that the cushion effect is undesirable. Nonetheless, it has been asserted by the Office that LoBianco teaches a compressible spacer, which would be subject to the cushion effect during wire bonding or other processing. Therefore, Pu teaches away from the asserted incorporation of teachings from LoBianco into its own teachings.

Furthermore, considering that Pu teaches that a compressible material might lead to the cushion effect and a resultant negative impact on bond quality, one skilled in the art would not reasonably expect a resiliently compressible spacer to succeed. This lack of a reasonable

expectation of success further indicates the non-obviousness of independent claim 1. *In re Rinehart*, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976).

Withdrawal of the 35 U.S.C. § 103(a) rejection of independent claim 1 is respectfully requested.

The withdrawal of the 35 U.S.C. §103(a) rejection of claims 3, 5-8, 10, 12-17, and 53 is also respectfully requested as each of these claims depends either directly or indirectly from allowable independent claim 1, among other reasons.

Claim 8 is additionally allowable as neither Pu nor LoBianco teaches or suggests a semiconductor device assembly that includes an adhesive material located between adjacent spacers.

Claim 17 is additionally allowable as neither Pu nor LoBianco teaches or suggests a semiconductor device assembly that includes at least one resiliently compressible spacer secured to a noncircuit bond pad of a semiconductor device.

Claim 53 is additionally allowable as neither Pu nor LoBianco teaches or suggests a semiconductor device assembly that includes at least one resiliently compressible spacer secured to a contact pad of a semiconductor device.

Pu in View of LoBianco and Foster

Claims 11, 22, 18-23, 25, 28, 30-35 and 54 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Pu as applied to LoBianco and further in combination with Foster.

The withdrawal of the 35 U.S.C. §103(a) rejections of claims 11 and 12 is respectfully requested as each depends from allowable independent claim 1, among other reasons.

As discussed above with respect to Pu and LoBianco, neither of these references provides any suggestion or motivation to combine their teachings in the asserted manner, nor would one skilled in the art be motivated to do so. Nor does Foster include any teaching or suggestion that remedies the fact that Pu teaches away from the asserted combination. The only apparent motivation to combine the references apparently derives from impermissible hindsight.

Therefore, the withdrawal of the 35 U.S.C. §103(a) rejections of amended independent claim 18 is respectfully requested

The withdrawal of the 35 U.S.C. §103(a) rejections of claims 19-23, 25, 30-35 and 54 is respectfully requested as each of these claims depends either directly or indirectly from allowable independent claim 18, among other reasons.

Foster in View of LoBianco

Claims 1, 3, 5-8, and 10-16 stand rejected under 35 U.S.C. § 103(a) for reciting subject matter which is assertedly unpatentable over that taught in Foster, as applied to LoBianco.

As discussed above with respect to LoBianco and Foster, neither of these references teaches nor suggests a resiliently compressible spacer, as recited in independent claim 1.

Because neither LoBianco nor Foster teaches a compressible spacer, any suggestion or motivation to modify or combine the references to form a resiliently compressible spacer therefore apparently derives from impermissible hindsight.

Therefore, in view of the foregoing arguments, the withdrawal of the 35 U.S.C. §103(a) rejection of independent claim 1 is respectfully requested.

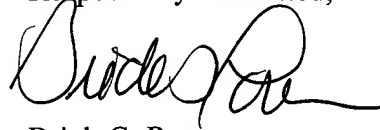
The withdrawal of the 35 U.S.C. §103(a) rejections of claims 3, 5-8, and 10-16 is respectfully requested as each of these claims depends either directly or indirectly from allowable independent claim 1, among other reasons.

CONCLUSION

It is respectfully submitted that each of claims 1, 3, 5-25, 28-35, 53 and 54 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing allowance of the above-referenced application remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

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Respectfully submitted,

A handwritten signature in black ink, appearing to read "Brick G. Power". The signature is fluid and cursive, with a large initial "B" and "P".

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